

Chapter 1

Knock, Knock, Knoppix on Bill's Gate

In This Chapter

- ▶ Introducing Linux
 - ▶ Understanding Linux distributions
 - ▶ Introducing Knoppix
-

This chapter is designed to help you get oriented with the Linux operating system. This introduction sets the basis for the rest of this book.



If you want to start Knoppix without reading about the nuts and bolts behind the scenes in Knoppix and Linux, you can skip this chapter and either

- ✓ Run Knoppix directly from the DVD (see Chapter 2).
- ✓ Permanently install Knoppix on your PC (see Part II).

Peeking behind the Curtain: Understanding the Linux Operating System

Linux is both a word and a term:

- ✓ In its narrowest use, Linux is an *operating system* that interfaces between computer hardware and the processes and applications that utilize the hardware. This is called the *Linux kernel*.

- ✓ Linux can also mean the Linux operating system plus *supporting software*, such as GNU utilities (which are described in this chapter).
- ✓ In its most general sense, Linux means the total package of the kernel, GNU utilities, applications, and graphical interface plus configuration and installation utilities. This combination is called a *Linux distribution*.

The following sections describe the essential Linux capabilities and subsystems.

Introducing the Linux OS

From a nerd's viewpoint, Linux is a *multiuser, multitasking* operating system:

- ✓ **Multiuser** means that two or more people can use the computer at the same time. Each user account maintains a separate identity that is, in general, limited from accessing other user accounts and system resources (unless specifically allowed access).
- ✓ **Multitasking** means that many applications and tasks can run at the same time. Users can run multiple applications, as can the operating system itself.



Browse the following Web pages to find out more information about multitasking and multiuser computers:

- www.webopedia.com/TERM/m/multitasking.html
- www.webopedia.com/TERM/m/multi_user.html

Linux, and thus Knoppix, has the following advantages over other operating systems:

- ✓ Linux runs *efficiently* without much memory or processing power.
- ✓ Linux *networking* is efficient, fast, and reliable.

From its first version, Linux included networking, while networking on other operating systems was first inserted as a kludge. Those operating systems still have serious shortcomings.



The Linux operating system is patterned after UNIX. Ken Thompson, Dennis Ritchie, and others invented UNIX at the AT&T Bell Laboratories in the late 1960s. UNIX became widely used by universities because it provided the advanced capabilities that previously were available only on mainframe computers. Today, UNIX is widely used on server-class computers. Linux is overtaking UNIX as the operating system of choice.

A small biography of a humble giant

Linus Torvalds was born and raised in Helsinki, Finland. He was named after the famous Nobel Prize-winning chemist Linus Pauling. (*This* Linus won both a Nobel Peace Prize and a Nobel Prize in Chemistry. My father was an admirer of Pauling, too.) Linus Torvalds attended the University of Helsinki in 1988 and received a master's degree in computer science in 1996.

Torvalds was dissatisfied with the operating systems available during his early years at the university, so he designed his own. He started by modifying the UNIX-like Minix operating system but then started writing from scratch (although he used the Minix file system for certain functions). After he had the — pardon the pun — *kernel* of Linux working, he opened it up for public development. That act leveraged the talent, intelligence, and sheer raw energy of many people to create a powerful operating system. (Linux developers were among the first to use the nascent Internet to communicate and collaborate.)

The following excerpt is Linus's August 25, 1991, posting on the `comp.os.minix` newsgroup announcing his new operating system.

```
Hello everybody out there using minix -
I'm doing a (free) operating system (just
a hobby, won't be big and professional
like gnu) for 386(486) AT clones. This has
been brewing since april, and is starting
to get ready. I'd like any feedback on
things people like/dislike in minix, as my
OS resembles it somewhat (same physical
layout of the file-system (due to
practical reasons) among other things).
```

```
I've currently ported bash(1.08) and
gcc(1.40), and things seem to work. This
implies that I'll get something practical
```

```
within a few months, and I'd like to know
what features most people would want. Any
suggestions are welcome, but I won't
promise I'll implement them :-)
```

```
Linus(torva...@kruuna.helsinki.fi)
```

```
PS. Yes - it's free of any minix code,
and it has a multi-threaded fs. It is NOT
portable (uses 386 task switching etc),
and it probably never will support
anything other than AT-harddisks,
as that's all I have :-).
```

I always love reading this post because it's an amazing bit of history. This single e-mail heralded the introduction of both the software and the relatively young process of interacting over the Internet that changed the world. Linux is today the basis for a significant part of the world's economy and creative process. The amount of economic effect is impossible to measure, but Linux runs much of the world's servers, workstations, and embedded computers. (It brings back memories of my own struggles to find an inexpensive way to share files on my company's private network. I found and started using Linux to satisfy that need. It was a wonderful feeling.) Many, many people use Linux to develop software, products, and other intellectual endeavors. Today, Linux is like air that software developers and users breathe. Linus Torvalds acts as the gatekeeper of Linux development.

Linus Torvalds probably wouldn't like the title of this sidebar. He doesn't like words like *giant* and phrases like *changed the world* associated with him. However, it's the truth. And his humility about his accomplishments gives the Linux world even more good vibes.

Understanding Linux distributions

The Linux operating system isn't one huge chunk of software like Microsoft Windows. Knoppix and Linux are constructed from several subsystems. They are as follows:

- ✓ **The Linux kernel:** This is the fundamental piece of software that coordinates the interaction between the human user and the computer's subsystems. Note that the term *Linux operating system* can mean the kernel or the overall system.
- ✓ **Linux modules:** The Linux kernel uses modules to interact with your computer hardware. For instance, the Linux kernel needs a module to work with your computer's sound card. Linux modules are analogous to Windows drivers.
- ✓ **GNU software:** Linux distributions include GNU software that provides compilers, utilities, software libraries, and the general stuff that makes using the Linux kernel practical and possible. The GNU license allows you to copy, modify, distribute, and sell the software.

The acronym GNU stands for "GNU's Not UNIX" — a nerd's acronym if ever there was one. GNU is a project of the Free Software Foundation, which develops and promotes free distributable software.

- ✓ **Open source software:** Most Linux distributions include applications, utilities, and other software that makes using your Linux computer easy and useful. Knoppix provides applications like Mozilla, OpenOffice.org, and the K Desktop Environment (KDE).
- ✓ **File systems:** Computers use media such as hard drives, USB memory sticks, and DVDs to store information in the form of files and directories, which are themselves stored on a *file system*.
By default, Knoppix uses a ram disk as an alternative to hard disks for file systems.
- ✓ **Installation and configuration utilities:** Linux distributions combine pre-existing software and protocols to satisfy a need or a market niche. They also add their own value by creating installation systems and configuration utilities. The following chapters cover Knoppix-centric systems.

When someone puts all the "Linux pieces" together, it's called a *Linux distribution*. There are many, many Linux distributions in the world. Most do not distinguish themselves enough to become popular. Klaus Knopper, however, put the pieces together in a unique and useful way to create the extremely useful and popular Knoppix Linux.



The kernel

The Linux kernel (or simply the kernel) is the essential, basic system that keeps your computer tuned, organized, and working for you. You can look at it like

- ✔ An orchestra conductor (in this case, the Linux kernel) that keeps all the musicians (applications and utilities) in tune and in sync.
- ✔ A traffic cop keeping your computer's internal traffic flowing smoothly.

Coordinating all the pieces of modern consumer PCs requires the Linux kernel to deal with the following:

✔ **Programs and applications that you use to accomplish work**

Programs can be either

- User-level applications that humans interact with, such as word processors.
- Utilities that help you configure the computer's subsystems, such as its graphical display and network systems.

✔ **Processes**

The Linux kernel deals with processes by allowing them to start and stop and by scheduling them to access computer resources such as the CPU, memory, networks, and file systems. It also takes external signals to control the processes. For instance, the kernel takes input and output (I/O) from humans typing on their keyboards and helps processes display to the monitor. It also performs other functions, but you get the idea. The Linux kernel makes it possible for you to interact with your computer and keeps the computer organized internally.

Modules and libraries

The Linux kernel must know what hardware components a computer comprises and how to interact with them. Each hardware component has its own specifications and requirements that define how it interacts with other computer subsystems. *Kernel modules* are software that the Linux kernel uses to interact and control individual hardware components.



Linux kernel modules are similar in function to Microsoft Windows drivers. Kernel modules and drivers are software that the operating system uses to interface with computer hardware.

Early in its development process, Linux didn't use kernel modules. All the hardware-related software was built (*compiled* in software terms) directly into the kernel. Such kernels are called *monolithic*.

However, monolithic kernels tend to get very large as more hardware makes it to market. Such kernels can't deal with new hardware plugged into a computer without rebooting. Modules, however, let the kernel keep its svelte figure while simultaneously accepting new devices. Devices like USB memory sticks, for instance, would be impractical without kernel modules.

Kernel modules provide an elegant, relatively simple mechanism to let the Linux kernel interact with many different and varied pieces of hardware.

Libraries provide a convenient software mechanism to consolidate operating systems, applications, and other functions. They provide access to common functions, such as interacting with a keyboard or drawing a menu button on your screen. Libraries let operating-system and application software reuse common functions rather than writing from scratch.

File systems

File systems physically organize bits and bytes on a storage medium. The operating system must be able to find where the bits are located on the media in order to read or write them. The most common storage medium is the hard drive, but it can also be old-style floppy diskettes, USB memory sticks, and RAM.

The file system is the structure that lets you easily interact with individual files or groups of files. *Directories* are a mechanism to organize similar files; Linux directories provide the same function as Windows folders.

GNU and open source software

The Linux kernel, GNU software, and many other familiar software are licensed as *open source software*. Open source software is both licensed and copyrighted. (Copyrighted open source software is sometimes called *copyleft* software.) The GNU General Public License (GPL) is the most common license for open source software. (GPL is often used as a verb. Open source software is often said to be *GPL'd*.)

The Free Software Foundation (FSF) designed the GNU GPL to be as unrestricted as possible. GPL'd software creates the following conditions:

- ✔ You can use and modify GPL-licensed software in any way you want as long as you don't restrict anyone else from using your modifications.
- ✔ You can give away or sell open source software. (You can even sell Knoppix if you want, but you'd better have a good marketing plan because it's easier to download it for free.)

Open-source software doesn't automatically mean free-of-charge software. The reason you can get such software for free is because the GPL creates a chain of unrestricted use.

Installation and configuration utilities

Linux distributors want you to use their products. Whether commercially based or not, it's in their interest to make using their distributions as easy as possible. Otherwise, their distributions don't get distributed and become very lonely.

To make life easier for you and to expand their market, Linux distributors provide tools and utilities to differentiate themselves. Knoppix provides network and other system administration tools to make your life easier. Knoppix adds value to Linux.

Live from DVD, It's Knoppix!

Knoppix is a Linux distribution that can run directly from a DVD (this is called a *live DVD*).



Chapter 2 shows you how to start Knoppix directly from the *Knoppix For Dummies* DVD without permanently installing Knoppix on your PC.

You can run Knoppix from a DVD on most PCs to

- ✓ **Use a full-featured graphical desktop and various applications, including Mozilla Firefox (Web browser) and the OpenOffice.org desktop productivity suite.**
- ✓ **Demonstrate Linux and commercial products.**
- ✓ **Troubleshoot and rescue a Windows computer.**



The full Knoppix distribution is included with this book on the companion DVD. You can download a “lite” Knoppix distribution that fits on a single CD-ROM from www.knoppix.net or www.knoppix.org.

Knoppix lets you boot from the DVD or CD without using or affecting the existing operating system at all; you don't have to install Knoppix on the computer to use it. This is the simplest way of getting access to the Linux operating system.

The default Knoppix operating mode boots directly from read-only media, using RAM (random access memory) to store the basic system files and your personal files. Part of your computer's RAM is set aside as *ram disk*, which emulates the function normally performed by a hard disk. The ram disk is faster than a hard disk but doesn't store information permanently — when you shut down your computer, its contents disappear.

Meet the man

Klaus Knopper created the Knoppix Linux distribution in 1999 to experiment with bootable Linux CDs. After he got his initial experiment to work, he started writing scripts and adding tools for his own use. He was also teaching computer classes at the time and found that being able to boot directly from CD-ROM made his life easier because he didn't have to worry about getting permission and taking the time to install Linux onto the classroom computers. He also found being able to use any available computer when traveling an added benefit.

Klaus's colleagues convinced him to publish the live CD at an early stage. He did so and got the feedback and software contributions that made the CD better and put it on a trajectory to success.

The rest is history. Klaus's project became a very popular and useful system. Klaus views Knoppix as a Debian system with the ability to boot off of DVD or CD. Knoppix can be and is viewed as a Linux distribution.

Klaus lives and works in Germany. He has a degree in Electrical Engineering (me too, Klaus!) and is a freelance consultant working in the open source field. You can learn more about the history and meaning of his project at www.knopper.net, www.knopper.net/knoppix/index-en.html (the English version), and www.knoppix.org. Eaden Mckee, from New Zealand, runs the great contributor's site www.knoppix.net.



Knoppix is based on the Debian Linux distribution. Debian is a widely used — especially in Europe — open source project. Debian is not developed by any single company but by the collective effort of many devoted individuals. Browse www.debian.org to find more information about the distribution and the Debian Project.

Ram disks store information as long as you maintain power to your computer. You can work around ram disk volatility (see Chapter 3) so it isn't much of a problem. Knoppix lets you store your *home directory* (like the My Documents folder in Windows) on *nonvolatile storage media* (such as USB memory sticks).

Knoppix can boot on many desktop and laptop PCs. I've successfully used it on nearly a dozen of them. So you stand a good chance of using it without problems.